

Supporting Medical Personnel at Analyzing Chronic Lung Diseases with Interactive Visualizations

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Introduction

Our proposed visualization system, akin to other works in health data visualization [LPK*16, RAM*11], focuses on effective exploration of time-oriented medical data, to facilitate comparison between different points in time.

Approach

Our prototype was designed in collaboration with domain experts, starting off with a workshop and continuing during development.

- 5 pneumologists and 2 visualization experts
- Gathering of common tasks and routinely asked questions
- Iterative prototype refinement via expert feedback
- Final design: web-based application with 5 components

Timeline

Evaluation

To evaluate the usability of our prototype, we remotely conducted a formative study via expert interviews. Together with two domain experts, we designed work-related questions with varying levels of difficulty.

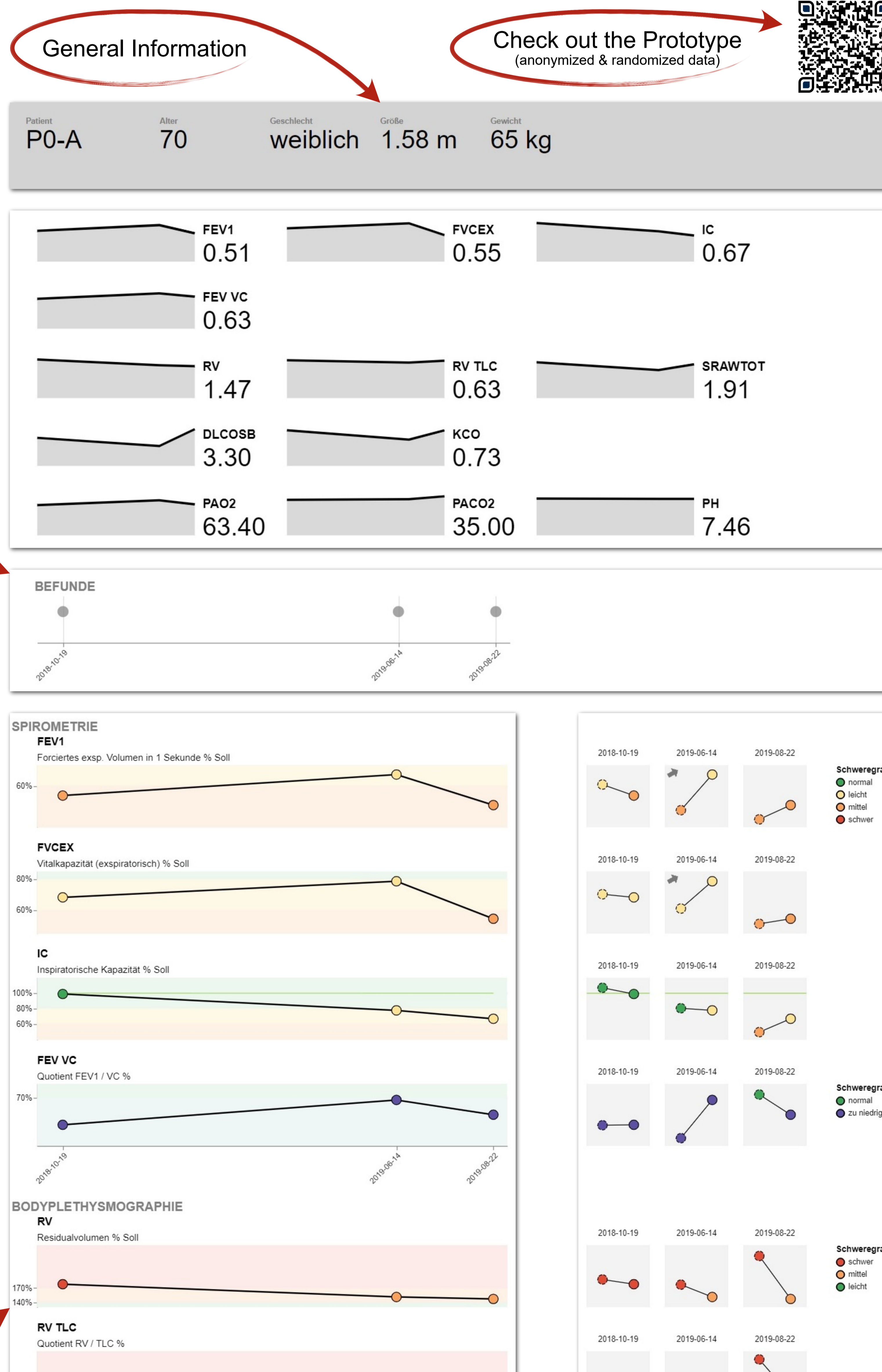
- 4 pneumologists as participants
- 2x6 Questions in 30 Minutes
- Test tasks common in day-to-day working activities
- Informal feedback and SUS questionnaire

Detailed Information

Abstract

We present a visualization system for medical practitioners to analyze lung function data collected at different points in time. In particular, our approach aims to solve the problems practitioners encounter in their daily work life when they have to consult different text-based documents to get access to the same data we provide in a single interface. To test the suitability of our system, we conducted a formative study. Our results indicate that our target users can easily work with our system and use it to answer both simple and difficult questions common in their daily work experience.

Components



Results

Participants were able to solve tasks correctly and gave positive feedback.

- Valid answers matching the experts' expectation
- Easy to compare data from different exams
- Simple to use for target user group

A closer analysis of the session recordings revealed several areas where our approach can be improved.

- Identifying measurement dates
- Overview charts unused
- Much vertical space needed which leads to scrolling
- Data-dependent width

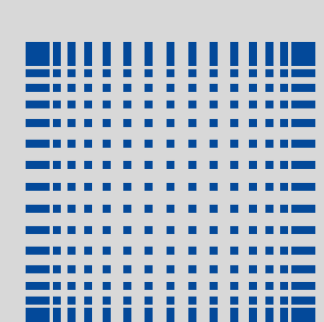
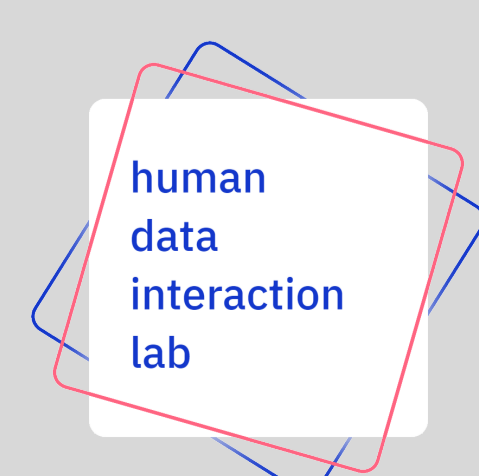
Overview

Future Work

Our formative study showed promising results with mostly positive feedback from all participants. However, some feedback and participants' interactions during the study indicated several areas for improvement, like the need to scroll in order to compare charts that are far apart in the layout. With the help of these observations, we intend to improve our prototype and investigate how it compares to other existing approaches in a controlled study setting.

References

- [LPK*16] LOORAK M. H., PERIN C., KAMAL N., HILL M., CARPENDALE S.: Timespan: Using visualization to explore temporal multi-dimensional data of stroke patients. *IEEE Trans. on Vis. and Comput. Graphics* 22, 1 (2016), 409–418. doi:10.1109/TVCG.2015.2467325.
- [RAM*11] BIND A., AIGNER W., MIKSCHE S., WILTNER S., POHL M., TURIC T., DREXLER F.: Visual exploration of time-oriented patient data for chronic diseases: Design study and evaluation. In *Symp. of the Workgroup Human-Computer Interaction and Usability Engineering of the Austrian Comp. Society* (2011).



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